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10/718,524	11/24/2003	David James Wilson	ALC 3098	1982

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EXAMINER	
PHAM, KHANH B	
ART UNIT	PAPER NUMBER
2166	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/718,524	WILSON, DAVID JAMES	
	Examiner	Art Unit	
	Khanh B. Pham	2166	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-21 and 23-26* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-21 and 23-26* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on February 14, 2007 has been entered. Claim 21 has been amended. Claims 1-21, 23-26 are pending in this Office Action.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. **Claim 25** is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. The terms "small enough" in claim 25 is a relative term which renders the claim indefinite. The term "small enough" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Claim 25 recites "n is selected small enough so that said grouping table fits in to a fast memory",

however, the size of the "fast memory" is not defined and therefore "small enough" is indefinite.

Claim Rejections - 35 USC § 101

5. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 24-26 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 24-26 are directed to memory storing a prefix length array and a search area for storing prefix length search tree, which are nonfunctional descriptive material. Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." Both types of "descriptive material" are nonstatutory when claimed as descriptive material *per se*, 33 F.3d at 1360, 31 USPQ2d at 1759. When functional descriptive material is recorded on some computer-readable medium, it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994)

Merely claiming nonfunctional descriptive material, i.e., abstract ideas, stored on a computer-readable medium, in a computer, or on an electromagnetic carrier signal, does not make it statutory. See *Diehr*, 450 U.S. at 185-86, 209 USPQ at 8 (noting that the claims for an algorithm in *Benson* were unpatentable as abstract ideas because

"[t]he sole practical application of the algorithm was in connection with the programming of a general purpose computer.").

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. **Claims 1-21, 23-26** are rejected under 35 U.S.C. 103(a) as being unpatentable over Davis (US 2004/0085953 A1), hereinafter "**Davis**", in view of Yu et al. (Forwarding Engine for Fast Routing Lookups and Updates"), hereinafter "**Yu**".

As per claim 1, Davis teaches a method of forwarding protocol data units in a router with a forwarding comprising:

- a) "selecting a window size of n window bits" at [0017], [0022]-[0023] and Figs. 2, 3A-B;
- b) "generating a grouping table with sets of prefix lengths based on said window size" at [0017]-[0018], [0026] and Figs. 2-5;
- c) "using said n window bits as a direct index into said grouping table to find an initial prefix length and provide an associated entry into said hash table" at at [0017]-[0018], [0026] and Figs. 2-5;

- d) "performing a lookup in said hash table based on said initial prefix length for matching said window bits with the bits of said associated entry" at [0016]-[0017] and Figs. 2-5;

Davis does not explicitly teach the use of "an offset of o offset bits" as claimed. However, Yu teaches a similar method for data routing including the step of selecting "sliding window" in conjunction with an offset bits at page 1558, Col. 2, 3rd paragraph. Yu suggest adding an offset bits to select the window in order to "distribute route prefixes evenly because "we defined these extraction fields based on first observing that patterns of trailing bits of an IP address or route prefix are more randomly distributed than those of leading bits" Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine Yu with Davis's teaching" in order to distribute route prefixes evenly and therefore reduce hash collision and improve searching speed.

As per claim 2, Davis and Yu teaches the method of claim 1 discussed above. Davis also teaches:

- e)"generating one of a hit pointer and a miss pointer in response to said lookup and loading said hit and miss pointer in to binary search tree" at [0026]-[0027] and Figs. 2-5;
- f)"determining the next prefix length for a respective miss pointer and hit pointer" at [0026]-[0027] and Figs. 2-5;

- g)"performing a further lookup in said hash table based on said next prefix length for matching said window bits with the bits of a further associated entry in said hash table" at [0026]-[0027] and Figs. 2-5.

As per claim 3, Davis and Yu teaches the method of claim 2 discussed above. Davis further teaches "repeating steps e), f) and g) until a longest matching prefix is obtained" at [0016], [0026]-[0027], [0033].

As per claim 4, Davis and Yu teaches the method of claim 3 discussed above. Davis further teaches "forwarding said PDU along a route identify by an IP address in said hash table corresponding to said longest matching prefix" at [0016], [0026].

As per claim 5, Davis and Yu teaches the method of claim 1 discussed above. Yu also teaches "selecting said offset such that the maximum number of prefix lengths per set is a minimum" at page 1558, Col. 2, 3rd paragraph.

As per claim 6, Davis and Yu teaches the method of claim 1 discussed above. Yu also teaches: "selecting said offset such that the average number of prefix length per set is minimized" at page 1558, Col. 2, 3rd paragraph.

As per claim 7, Davis and Yu teaches the method of claim 1 discussed above. Yu also teaches: "dynamically tuning the order of prefix lengths searched in said

grouping table using statistical data collected at said router" at section 5.2.1 and 5.2.2. and 9.

As per claim 8, Davis and Yu teaches the method of claim 7 discussed above. Yu also teaches: "wherein said statistical data indicate the hits for each prefix lengths in each set" at section 5.2.1 and 5.2.2.

As per claim 9, Davis and Yu teaches the method of claim 7 discussed above. Yu also teaches: "said lookup is dynamically tuned to process the prefix lengths in order from the prefix lengths with a greater percentage of hits" at section 5.2.1 and 5.2.2. and 9.

As per claim 10, Davis and Yu teaches the method of claim 1 discussed above. Davis also teaches: "said hash table is updated when said window is updated" at [0040].

As per claim 11, Davis and Yu teaches the method of claim 1 discussed above. Davis also teaches "wherein said window is a uni-dimensional window comprising a predetermined number of consecutive bits" at Figs. 2-3A-B.

As per claim 12, Davis and Yu teaches the method of claim 1 discussed above. Davis Yu also teaches: "wherein said window is a multi-dimensional window comprising a predetermined number of groups of consecutive bits" at [0028] and Figs. 2, 3AB.

As per claim 13, Davis and Yu teaches the method of claim 1 discussed above. Davis also teaches: "wherein the number of bits of said windows is selected for enabling said grouping table to fit into a fast memory" at [0031]-[0032] and Figs. 3A-B.

As per claim 14, Davis and Yu teaches the method of claim 1 discussed above. Davis also teaches: "wherein the window size n is user-selectable" at [0017].

As per claim 15, Davis and Yu teaches the method of claim 2 discussed above. Davis also teaches: "selecting said offset using said binary tree" at [0006], [0028] and Figs. 3A-B.

As per claim 16, Davis and Yu teaches the method of claim 2 discussed above. Davis also teaches "wherein said binary tree is made up of a root tree generated by said offset bits, partial trees within said window generated by said window bits, and sub-tree subtended by said partial trees" at [0006], [0028] and Figs. 3A-B.

As per claim 17, Davis and Yu teaches the method of claim 16 discussed above. Davis also teaches: "the number of prefix lengths searched for said window and said offset is a set union of the prefix lengths in said root tree, the prefix lengths of the sub-trees grouped by said window bits, and the extended prefix lengths occurring within the window grouped by said window bits" at [0006], [0028] , [0031] and Figs. 3A-B.

As per claim 18, Davis and Yu teaches the method of claim 17 discussed above. Davis also teaches: "wherein said set union is obtained by iterating over all nodes of the tree within said window" at [0006], [0028] , [0031] and Figs. 3A-B.

As per claim 19, Davis and Yu teaches the method of claim 1 discussed above. Davis also teaches: "wherein said n and o are chosen periodically on a best effort basis" at [0016], [0040].

As per claim 20, Davis and Yu teaches the method of claim 1 discussed above. Davis also teaches: "wherein said n and o are chosen at router startup, and updated as a low priority background application" [0020], [0040] and Fig. 5.

As per claim 21, Davis teaches a method of forwarding a protocol data unit (PDU) at a router with a forwarding hash table containing prefix lengths comprising:

- "dividing the prefix lengths available in said hash table into groups" at Fig. 3B;
- "routing said PDU according to a lookup in said hash table based on the prefix lengths in a selected group of said groups" at Fig. 3B.
- "wherein said step of dividing comprises selecting a window of n bits from an IP address of said PDU at [0017] and Figs. 2-5;
- "and arranging said selected group in the form of a grouping table with all prefix lengths available for said n bits" at Figs. 3B;

Davis does not explicitly teach the use of "said prefix lengths are based on n and a number of offset bits" as claimed. However, Yu teaches a similar method for data routing including the step of selecting "sliding window" of size n in conjunction with an offset bits at page 1558, Col. 2, 3rd paragraph. Yu suggest adding an offset bits to select the window in order to "distribute route prefixes evenly because "we defined these extraction fields based on first observing that patterns of trailing bits of an IP address or route prefix are more randomly distributed than those of leading bits" Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine Yu with Davis's teaching" in order to distribute route prefixes evenly and therefore reduce hash collision and improve searching speed.

As per claim 23, Davis and Yu teaches the method of claim 21 discussed above. Davis also teaches: "using said n bits for finding an initial prefix length in said grouping table, to determine an associated entry into said hash table; and "performing a look up in said hash table based on said initial prefix length for matching" at Fig. 3B.

As per claim 24, Davis teaches a memory for storing data for access by a routing program being executed on a router having a hash table comprising:

- "a prefix length array for storing a grouping table comprising 2n entries, each entry corresponding to a prefix length available for matching n bits of an IP address of a protocol data unit (PDU) at [0036] and Figs. 3A, 4;

- "a search area for storing a prefix length search tree constructed using said grouping table based on lookup in said hash table, said lookup being performed for a prefix length in said grouping table, using said n bits in said IP address" at [0031], [0040].

Davis teaches the prefix length is based on n at [0017] but does not explicitly teach the use of "the prefix length is based on n and a number of offset bits" as claimed. However, Yu teaches a similar method for data routing including the step of selecting "sliding window" in conjunction with an offset bits at page 1558, Col. 2, 3rd paragraph. Yu suggest adding an offset bits to select the window in order to "distribute route prefixes evenly because "we defined these extraction fields based on first observing that patterns of trailing bits of an IP address or route prefix are more randomly distributed than those of leading bits" Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to combine Yu with Davis's teaching" in order to distribute route prefixes evenly and therefore reduce hash collision and improve searching speed.

As per claim 25, Davis and Yu teaches the method of claim 24 discussed above. Davis teaches that "n is selected small enough so that said grouping table fits into a fast memory" at [0031]-[0032].

As per claim 26, Davis and Yu teaches the method of claim 24 discussed above. Yu also teaches: "said prefix length search tree is constructed based on dynamic

flow measurements to favor prefix lengths with are used by the majority of the PDU at said router" at section 5.2.1 and 5.2.2.

Response to Arguments

8. Applicant's arguments with respect to claims 1-21, 23-26 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

The prior art made of record, listed on form PTO-892, and not relied upon, if any, is considered pertinent to applicant's disclosure.

If a reference indicated as being mailed on PTO-FORM 892 has not been enclosed in this action, please contact Lisa Craney whose telephone number is **(571) 272-3574** for faster service.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh B. Pham whose telephone number is (571) 272-4116. The examiner can normally be reached on Monday through Friday 7:30am to 4:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hosain Alam can be reached on (571) 272-3978. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Khanh B. Pham
Primary Examiner
Art Unit 2166

May 15, 2007